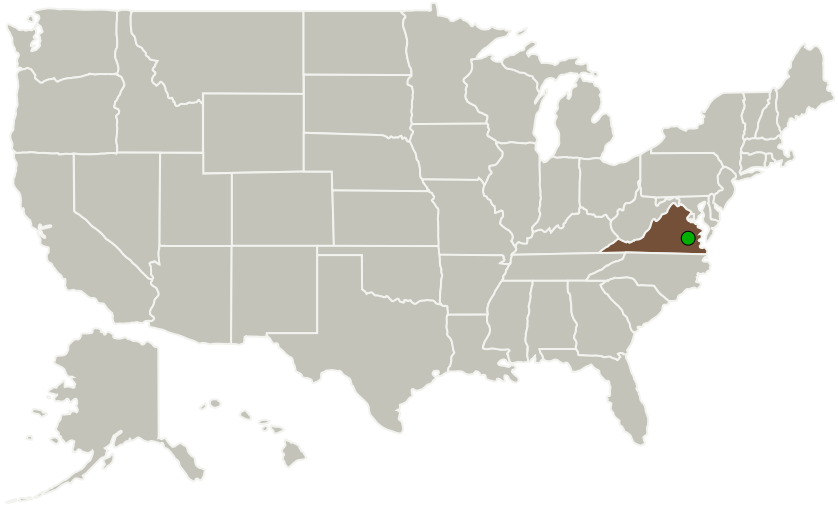
Development of a "Digital Bridge" Thermal Anemometer for Turbulence Measurements, Phase II

Completed Technology Project (2015 - 2018)

Project Introduction

Thermal anemometry (a.k.a. hot-wire anemometry) has been a key experimental technique in fluid mechanics for many decades. Due to the small physical size and high frequency response of the sensors (resulting in excellent spatial and temporal resolution), the technique has been widely used for studies of turbulent flows. Even with the advent of nonintrusive techniques such as Laser Doppler Velocimetry (LDV) and Particle Image Velocimetry (PIV), hot wire anemometry is uniquely capable of extremely high frequency response and fine spatial resolution measurements. ViGYAN has demonstrated a fundamental change to the anemometer configuration, with two related aspects. First, the circuitry to power the sensor and establish its operating point is packaged immediately adjacent to the sensor, i.e. in the typical probe holder, removing the effect of the cable connecting the sensor to an external anemometer. Second, modern analog-digital conversion hardware has been employed to the maximum extent possible, including directly driving the sensor. Data transmission is fully digital, immune to environmental variations or electrical noise. Based on these results, the Phase II work will deploy this "Digital Bridge" system using a Digital Signal Processing (DSP) device connected via fiber-optic cable the miniaturized "probe holder" electronics. The DSP will be controlled by a generic PC with software to control the system and acquire/store data. A production-ready version will be developed and delivered; facilities, expertise, and resources are available to fabricate and deliver production units at the conclusion of Phase II. Production designs for ruggedized units will also be done for use in wind tunnels that operate at higher dynamic pressures and extreme temperatures.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Vigyan, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB), Women-Owned Small Business (WOSB)	Hampton, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

May 2015: Project Start

January 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137667)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Vigyan, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

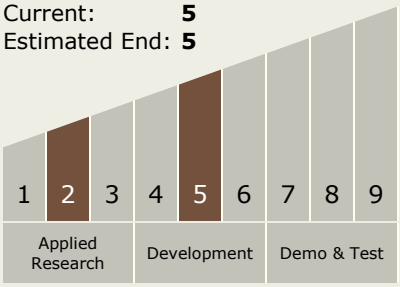
Carlos Torrez

Principal Investigator:

John F Bledsoe

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



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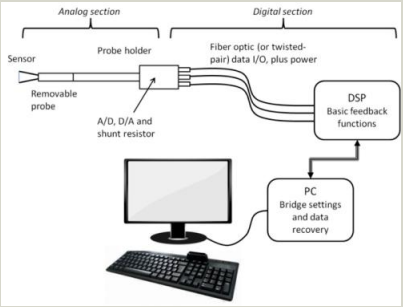
Images



Briefing Chart
Development of a "Digital Bridge" Thermal Anemometer for Turbulence Measurements Briefing Chart
(https://techport.nasa.gov/image/127304)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System